

Application No.: 10/524,753
Filing Date: July 28, 2005

AMENDMENTS TO THE DRAWINGS

Figure 1 is amended to add the "thermopile element" as requested by the Examiner, and to add reference number 2. Support for these amendments can be found, for example, at page 14, lines 30-36 and at page 23, lines 6-18 of the specification as originally filed.

A "Replacement Sheet" for amended Figure 1 is submitted herewith, and can be found in the Appendix.

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REMARKS

In response to the Office Action dated June 26, 2008, Applicant submits the foregoing amendments and following remarks. Claims 154, 157, 159, 164 and 166 have been amended. Claims 140-171 remain present for examination. Reconsideration of the application in view of this Amendment is respectfully requested.

Objection to the Drawings

Figure 1 is amended to add the "thermopile element" as requested by the Examiner. Figure 1 has also been amended to add reference number 2 which had been inadvertently left off of the original drawing. Support for these amendments can be found in the specification as originally filed, for example, at page 14, lines 30-36, and at page 23, lines 6-18. No new matter has been added by these amendments.

Amendment to the Specification

The specification has been amended to correct an inadvertent typographical error, and to include a description of the thermopile element added to Figure 1 as explained above. Support for this amendment can be found, for example, at page 14, lines 30-36; thus, no new matter has been added.

Rejection of the Claims under 35 U.S.C. §112

Claims 154-155, 157, 159 and 164-169 are rejected as being indefinite.

Claims 154, 157, and 166 have been amended to correct the antecedent basis for certain limitations as required by the Examiner.

Claim 159 has been amended to remove reference to individual "systems."

Claim 164 has been amended to recite "the micro pumping system."

Thus, reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, second paragraph, is respectfully requested.

Rejection of the Claims under 35 U.S.C. §103

Claims 140-148, 150-156 and 158-171 are rejected as obvious over Prosperetti et al. US2001/0010799 in view of Shiraishi U.S. Patent 6071081 and Suzuki U.S. Patent 4795243. According to the Examiner, it would have been obvious "to modify the disclosure of Prosperetti et al. with the teaching of Shiraishi in order to obtain a micro pump in which an alternative means it utilized to form a vapor bubble by substituting the heater element (46) according to

Prosperetti et al., with the light source as described by Shiraishi and further to incorporate a moving means (16, 18 and 18a) as taught by Suzuki to provide means for irradiating multiple section within a channel.”

Prosperetti is, in all embodiments, characterized by localized heating provided by stationary heating elements. The inherent problem with these types of micro pumps that utilize localized heating via heating elements is that they require fast thermal cycling, wherein each heating element must be quickly heated and then quickly cooled. This thermal cycling is hard on the micro pumps and relatively fast deterioration is typically seen. Thus, the thermal problems created by these stationary heating elements are well known.

Neither Shiraishi nor Suzuki discloses anything that would address these thermal problems. Shiraishi is an example of a micro pump which applies principles from familiar macro systems in a miniaturized version, including the use of one-way valves. The pump of Shiraishi is similar to a membrane pump where the bubble is akin to the membrane. Similar to the workings of a membrane pump, the bubble as taught by Shiraishi is stationary, and does not move other than to expand and contract. The use of one-way valves is required to direct the flow of the fluid. Shiraishi therefore teaches creating, but not moving, film bubbles through the application of high heat, requiring the same stationary heating elements and thermal cycling as the pump described in Prosperetti. One of ordinary skill in the art therefore had no reason to look to Shiraishi to overcome the problems associated with the pump of Prosperetti.

Suzuki teaches means for moving a “granular member.” This granular member can be a vapor bubble, or can be “a component not readily dissolvable in liquid, such as, for example, a bubble of argon, air, oxygen, hydrogen, helium, neon, carbon monoxide, nitrogen monoxide or methane mixed with a water solution.” Column 1, lines 33-37. The granular member can also be a solid or liquid. If a vapor bubble is to be used, heating elements in the form of heat-generating resistance members are responsible for creating the granular member in the form of a bubble. See Column 3, lines 29-33. Suzuki is concerned with moving the bubbles around in connection with applications within optical displays, etc. Thus, the person skilled in the art would not look to Suzuki for micro pump variations. Further, it is the stationary heating elements, not the light source, that are responsible for creating the granular members described in Suzuki. Thus, nothing in Suzuki teaches the creation of vapor bubbles through the application of a light source.

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One of ordinary skill in the art would have no reason to look to Suzuki to resolve the thermal problems created by the localized, stationary heating elements used to create the bubbles in both Prosperetti and Shiraishi, and furthermore, none of the cited references disclose anything other than the use of these stationary heating elements to create the vapor or film bubbles.

For these reasons, one of ordinary skill in the art would have no reason to combine Prosperetti, Shiraishi and Suzuki to achieve the present invention, and even when combined, these references fail to teach each and every element of the claimed invention. Thus, these references do not render the claimed invention obvious.

As the remaining rejections of Claims 149 and 157 also rely on the combination of Prosperetti, Shiraishi and Suzuki, but further in view of Wiedemann U.S. Patent 4159427 and Schembri U.S. Patent 6189659, respectively, this same reasoning applies. The combination of the cited references fails to render these claims obvious.

Withdrawal of the rejection of the claims under 35 U.S.C. §103 is therefore respectfully requested.

No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

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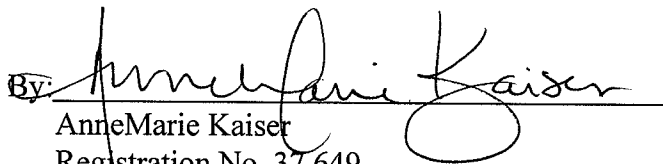
Should the Examiner have any remaining issues that might be resolved by telephone, he is invited to contact the undersigned attorney at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

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By: 
AnneMarie Kaiser
Registration No. 37,649
Attorney of Record
Customer No. 20995
(949) 760-0404

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